CLAIMS

I/We claim:

1. A precharge circuit comprising:

a power source;

a first transistor in electrical communication with the power source; and

a second transistor in electrical communication with the first transistor, the second transistor configured to provide feedback to the first transistor and adjust current flowing through the first transistor based on a temperature of the first transistor.

2. The precharge circuit according to claim 1, wherein the second transistor is configured to decrease current flowing through the first transistor as the temperature of the first transistor increases.

3. The precharge circuit according to claim 2, wherein the second transistor is a bipolar transistor.

4. The precharge circuit according to claim 3, wherein the second transistor is a PNP transistor.

5. The precharge circuit according to claim 4, wherein the second transistor has a negative base-emitter voltage temperature coefficient.

6. The precharge circuit according to claim 5, wherein the first transistor is a MOSFET.

7. The precharge circuit according to claim 6, wherein the first transistor is a P-channel MOSFET.

8. The precharge circuit according to claim 3, further comprising a thermal conductor connecting the first and second transistor and configured transfer heat from the first transistor to the second transistor.

9. The precharge circuit according to claim 8, wherein the thermal conductor is a circuit trace.

10. The precharge circuit according to claim 9, wherein the circuit trace has a width of greater than 2 mm.

11. The precharge circuit according to claim 8, wherein the thermal conductor is connected between a body of the first transistor and a body of the second transistor.

12. The precharge circuit according to claim 3, wherein the second transistor is positioned within about 5 mm or closer from the first transistor.

13. The precharge circuit according to claim 3, wherein a collector of the second transistor is connected to a gate of the first transistor.

14. The precharge circuit according to claim 13, further comprising a sense resistor connected between the power source and a source of the first transistor.

15. The precharge circuit according to claim 14, wherein the sense resistor has a power rating of less than 1 Watt.

16. The precharge circuit according to claim 13, further comprising a diode connected between the power source and a source of the first transistor.

17. The precharge circuit according to claim 16, wherein the anode of the diode is connected to the power source and the cathode of the diode is connected to the source of the first transistor.

18. The precharge circuit according to claim 13, wherein a base of the second transistor is connected to the cathode of the diode through a resistor.

19. The precharge circuit according to claim 13, wherein an emitter of the second transistor is in electrical communication with the power source.

20. The precharge circuit according to claim 13, wherein a drain of the first transistor is in electrical communication with an electrical ground through a capacitor.

21. The precharge circuit according to claim 13, further comprising a third transistor in electrical communication with an input node, the first transistor, and the second transistor.

22. The precharge circuit according to claim 21, wherein the third transistor is an NPN transistor.

23. The precharge circuit according to claim 22, wherein a base of the third transistor is connected to the input node through a first resistor.

24. The precharge circuit according to claim 23, wherein a collector of the third transistor is connected to a gate of the first transistor and the collector of the second transistor through a second resistor.

25. The precharge circuit according to claim 24, wherein an emitter of the third transistor is connected to an electrical ground.

26. The precharge circuit according to claim 13, further comprising a relay connected between the power source and a drain of the first transistor.

27. The precharge circuit according to claim 26, wherein the relay is configured to bypass the first transistor when a predetermined voltage threshold has been exceeded at the drain of a first transistor.

28. A precharge circuit comprising:

a power source;

a P-channel MOSFET transistor in electrical communication with the power source;

a bipolar PNP transistor in electrical communication with the P-channel MOSFET transistor, the bipolar PNP transistor configured to provide negative feedback to the P-channel MOSFET transistor and decrease current flowing through the P-channel MOSFET transistor as the temperature of the P-channel MOSFET transistor increases; and

a thermal conductor connected between a collector of the bipolar PNP transistor and a gate of the P-channel MOSFET, the thermal conductor being configured to transfer heat from the P-channel MOSFET to the bipolar PNP transistor.

29. The precharge circuit according to claim 28, wherein the bipolar PNP transistor is positioned within about 5 mm or closer from the first transistor.

30. The precharge circuit according to claim 28, further comprising a resistive load having a power rating of less than 1 Watt, the resistive load being connected between the power source and a source of the P-channel MOSFET.

31. The precharge circuit according to claim 28, further comprising a diode, wherein the anode of the diode is connected to the power source and the cathode of the diode is connected to a source of the P-channel MOSFET.